situs'. In defining space as an order of situations, Leibniz was therefore using *Newton's own words.*[117]

Taking the definition of space from Newton, after all, would have been an extraordinary dialectical move for Leibniz. Newton had stated that bodies are placed in an order of situations, and Leibniz's claim was that such an order was sufficient to define space—without presupposing a further hypostatic extension beyond the order. In this way, Leibniz could fight Newton and Newtonians on common ground and employ their own terminology.

If this was the case, the *Principia* not only prompted Leibniz to envision a relational theory of space in opposition to Newton's but offered him the basic notion of this new theory: the definition of space itself.

(2) In his comments on Fardella, Leibniz has already *modalized* the theory of space and defined space as an order of *possibilities* rather than as an order of actual situational relations among bodies. This was a novelty with respect to Newton's (and others') notion of spatial ordering. The reference to possibility is therefore a feature of Leibniz's theory of relational space that was formulated from its very beginning.[118] It implied, among other things, that space is unique and does not depend on the structure of each possible

[117] See above, note 103, the quote from Newton, *Principia*, 5–6; the idea recurred in the *De gravitatione* (Hall and Hall, *Newton*, 103). The similarity between Leibniz's and Newton's positions was noted by H. Stein, 'Newtonian Space-Time', in R. Palter (ed.), *The Annus Mirabilis of Sir Isaac Newton, 1666–1966* (Cambridge: MIT Press, 1970 [1967]), 258–84, who, however, could not suspect that it was not a mere coincidence but a straightforward textual dependence.

[118] I have already noted in De Risi, *Geometry and Monadology*, 564, n. 86, that Leibniz's modalized theory of space has some points of contact with Barrow's semi-Scholastic theory, which defined space as the *capacitas*, *ponibilitas*, or *interponibilitas* of magnitudes (*Lectiones mathematicae*, X; in W. Whewell [ed.], *I. Barrow. The Mathematical Works* [Cambridge: Cambridge University Press, 1860], 158). Nonetheless, there were also important differences: Leibniz's notion of possibility was very different from Barrow's (in virtue of his theory of possible worlds); Leibniz did not regard space as the possibility *of magnitudes*, since he had relinquished the Neoplatonic connection between space and quantity; Leibniz claimed (against Barrow, as well as against Newton and Clarke) that if the world had not existed, space would not have existed either (Fourth Letter to Clarke, § 41, and Fifth Letter, §106; Robinet, *Leibniz–Clarke*, 97 and 172); and, most of all, Barrow never conceived of space as a system of relations. Given these and other differences, I disagree with Slowik (*Space*, 71), who accepted my remark on a certain similarity between Leibniz and Barrow but pushed it too far, I think, by claiming that Leibniz's and Barrow's theories were 'nearly identical'. In any case, I do not think and have never stated that Barrow 'sided with absolutism' (Slowik, *Space*, 71): there were many more than two seventeenth-century theories of space to side with (cf. E. Slowik, 'Substantivalism and Relationism as Bad Cartography: Why Spatial Ontology Needs a Better Map', in S. Wuppuluri and F. A. Doria [eds.], *The Map and the Territory* [Springer: Cham, 2018], 185–98). I may add that currently we have no explicit evidence that Leibniz read Barrow's *Lectiones mathematicae*.

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world. Accordingly, geometrical theorems on the properties of space are *necessary*.[119]

(3) The fact that space is *abstract* rather than concrete is an immediate consequence of its being an order of relations or just 'a relation', since both relations and orders were from his early years consistently treated by Leibniz as abstract entities. Moreover, the modalized reference to an order of *possibilities* rules out that space is a concrete object obtained from the actual world of bodies by abstracting from its qualities: it is, rather, the result of a more complex intellectual operation. The culminating instance of this theory comes from the celebrated §47 of the Fifth Letter to Clarke, in which Leibniz described in great detail the procedure of abstraction producing the notion of space.[120] It should be noted, however, that the characterization of space as an 'incomplete concrete' being recurs two or three times (as far as I can find) in manuscripts written after 1688. In some of these, Leibniz qualifies the claim by saying 'according to the School' or 'following common opinion'. In the absence of a greater number of edited texts, I do not venture here any speculation on these statements.[121] In any case there cannot be any doubt that Leibniz quite consistently characterized space as abstract in the late years.

[119] For a late statement on the independence of space from the actual world, see Leibniz's letter to Des Bosses from 31 July 1709: 'Massa ejusque diffusio resultat ex Monadibus, sed non spatium. Nam spatium, perinde ac tempus, ordo est quidam, nempe (pro spatio) coexistendi, qui non actualia tantum, sed et possibilia complectitur. . . . Si aliae essent in natura rerum subdivisiones corporum organicorum in corpora organica, aliae essent Monades, alia massa, etsi idem foret spatium quod impleretur. Nempe spatium est continuum quoddam, sed ideale . . .' (GP II, 379; Look and Rutherford, *Des Bosses*, 140). A contrary opinion on the dependency of Leibniz's geometry on the actual world was held by N. Rescher, *Leibniz's Metaphysics of Nature* (Dordrecht: Reidel, 1981). The issue connects to the Principle of Reason: see De Risi, *Leibniz on Parallels*, and V. Debuiche and D. Rabouin, 'On the Plurality of Spaces in Leibniz', in De Risi, *Mathematizing*, 171–201.

[120] See Robinet, *Leibniz–Clarke*, 142–5. The idea had already been hinted at in a text from 1678 (A VI, 4, N. 367, 2018) dealing with *locus*, but without explicit references to the procedure of abstraction, or to space itself. Remarkably, the example of Euclid's procedure of definition by abstraction (described in Leibniz's Fifth Letter) also recurred in a text, *De realitate accidentium*, which seems to have been written in the same fall/winter 1688 in which Leibniz was elaborating his new notion of space (A VI, 4, N. 209, 996). See also the letter to De Volder of 1703, in which Leibniz calls mathematical space an 'incomplete and abstract notion' (GP II, 249; also in P. Lodge [ed.], *The Leibniz–De Volder Correspondence* [*De Volder*] [New Haven: Yale University Press, 2013], 258). Cf. *Nouveaux Essais*, II, 1 §2 (A VI, 6, N. 2, 110); and II, 4, §5 (A VI, 6, N. 2, 127).

[121] Cf., for instance, the claim that 'Concretum Scholasticorum est vel incompletum vel completum', in LH IV, 7c, Bl. 91r, also referring to space. Cf. also LH IV, 8, Bl. 102; and L. Couturat (ed.), *Opuscules et fragments inédits de Leibniz* [*Opuscules*] (Paris: Alcan, 1903), 538. One of Leibniz deepest reflections on the abstract and the concrete dates from the fated fall/winter 1688, that is, probably a few weeks before the *Specimen inventorum*; see A VI, 4, N. 208, 987–94. In this text, space is still regarded as an 'extensio per se absoluta, . . . interminata, impartibilis, omnis mutationis expers' (990), rather than a system of relations.

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(4) The characterization of space as an abstract entity immediately implied that it could not be a *phenomenon* like matter or bodies. This shift is witnessed by one of Leibniz's most important foundational essays, the *Primae veritates*, written just a few months after the late-1688 breakthrough. Here for the first time Leibniz gave an argument against substantial space based on the Principle of Indiscernibles, claiming that two parts of an extended space would be indiscernible to one another and therefore space cannot exist as an independent entity. He concluded that space is not a thing, *non est res*.[122] Later in the same essay, Leibniz restated the point about non-existence but attempted to add a positive characterization:

> *Spatium tempus extensio et motus non sunt res, sed phae*

He stopped writing and erased the half-word that had slipped from the quill. Leibniz started anew:

> *Spatium tempus extensio et motus non sunt res, sed ~~phae~~ modi considerandi fundamentum habentes.*
> Space, time, extension, and motion are not things but . . . modes of considering having a foundation.

Leibniz must have realized, perhaps for the first time, that the new definition of space pushed him to draw a line separating physical phenomena from more abstract entities such as space and time. At first, he attempted to call both phenomena and abstract entities 'modes of considering'. Apparently, however, he was unsatisfied with this general expression and began to embrace a three-tiered ontology of substances, phenomena, and ideal objects. Leaving for another time the decision on what space and time—which are neither substances nor phenomena—could be, he deleted any reference to them and wrote down the final version of the text:

> *~~Spatium tempus extensio et motus non sunt res, sed phae modi considerandi fundamentum habentes~~. Extensio et motus et ipsa corpora, quatenus in his*

[122] The argument is about empty space and excludes the existence of a vacuum. Leibniz himself, however, extended it to assert that space and time are not things. See the *Principia logico-metaphysica* (as the Academy edition calls the text previously known as *Primae veritates*), in A VI, 4, N. 324, 1647.

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> *solis collocantur, non sunt substantiae, sed phaenomena vera, ut irides et parhelia.*
> Extension, motion, and bodies themselves, insofar as they consist in extension and motion alone, are not substances but true phenomena, like rainbows and parhelia.[123]

From here on, Leibniz may never again have said that space is a phenomenon.[124]

In the following years, Leibniz worked on offering a positive characterization of the ontological status of space. As far as we can say from current editions, it seems that the first time Leibniz used the word '*idealis*' in this sense was in his *Remarques* to Foucher of September 1695. In this essay, Leibniz stated that mathematical entities, such as a line, are abstract—and indeed *ideal*. It is reasonable to think that he considered space as a whole to be ideal as well.[125] The term became frequent in the following years, consistently characterizing space and time as ideal beings, and was widely employed in Leibniz's correspondence with De Volder (1698–1706) and with Des Bosses (1706–16).[126]

In the same letter to Foucher, Leibniz also stated that in ideal entities the whole precedes the parts. From this time on, Leibniz quite often repeated this

[123] This text was first published by Couturat, *Opuscules*, 518–23, who signaled in square brackets the first corrected sentence (the one referring to *modi considerandi*). Leroy Loemker translated the bracketed sentence into English along with the final sentence, without noting that it had been deleted by Leibniz. He also dated the essay to 1680–4. See L. E. Loemker (ed.), *G. W. Leibniz. Philosophical Papers and Letters* (Dordrecht: Reidel, 1969; 1st ed. 1956), 270. As a result, English-language studies relied for a long time on an misdated text of the *Primae veritates* mentioning space in the context of phenomenalism. So, for instance, Cover and Hartz, 'Space', and Crockett, 'Space', like many others, regarded the *Primae veritates* as a text in which Leibniz asserted that space is a phenomenon. The much better edition of R. Ariew and D. Garber (eds.), *G. W. Leibniz. Philosophical Essays* (Indianapolis: Hackett, 1989), 34, gave the correct dating and deleted Couturat's bracketed sentence altogether, leaving only the final version not referring to space. The Academy edition, finally, documents Leibniz's uncertainty and the various drafts, including the deleted half-reference to phenomena (A VI, 4, N. 324, 1648).

[124] In current editions, I was unable to find any claim to the effect that space is a phenomenon which is certainly dated after 1689. Arthur proposes some Leibnizian texts that he claims prove the persistence of Leibniz's views on space as a phenomenon in later years (Arthur, *Leibniz*, 215), but they either do not say anything clear to this effect (A VI, 4, N. 317, 1638; GP II, 282), are manuscripts still to be dated with certainty (LH IV, 3, 5e, Bl. 24), or employ quite peculiar and unique expressions (GP II, 438: space as a 'phenomenon of God'). We need to wait for the complete edition of Leibniz's philosophical papers to have a final statement on this matter.

[125] The *Remarques* are in GP IV, 490–3. Arthur, *Leibniz*, 209, claimed, against Cover and Hartz, 'Space', that 'ideal' was already used by Leibniz in 1676, but did not provide any evidence to this effect.

[126] By contrast, Leibniz called Newton's absolute space a 'fiction'. See the 1708 *Remarques sur l'écrit de Locke*, in A VI, 6, N. 3_5, 555.

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